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High prevalence of multiple and severe vertebral fractures in male geriatric outpatients

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Submitted

Abstract

Introduction: to investigate prevalence and underlying risk factors for vertebral fractures in male geriatric outpatients on radiographs of the thoracolumbar spine.

Methods: 176 men, mean age 80 years, first-time visiting a geriatric day hospital, underwent a comprehensive geriatric assessment, routine laboratory investigation and lateral X-rays of the chest and lumbar spine. The presence of vertebral fractures was assessed by using a semi-quantitative method. Co-morbidity, use of medication, mobility, falls, and cognitive decline were scored.

Results: Prevalent vertebral fractures were found in 85 of 176 men (48%). In the men with a vertebral fracture, 52% (44/85) had moderate and/or severe fractures and 40% (34/85) had at least two vertebral fractures. None of the measured variables could be identified as a risk factor for the presence of vertebral fractures in this population.

Conclusion: This study showed a high prevalence of vertebral fractures among male geriatric patients. Roughly half of the ones with a vertebral fracture had a moderate and/or severe fracture, and 40% had multiple fractures, indicating severe underlying osteoporosis and high risk of future vertebral and non-vertebral fractures. These findings in combination with the silent occurrence, lack of risk factors to identify these patients clinically and the availability of effective and relatively safe anti-osteoporotic medication, suggest that it is advisable to screen all male patients who visit a geriatric day clinic with radiography of the spine.

Introduction

Vertebral fractures are the most common fractures in the elderly and their incidence is rising with age [1]. It has become clear that vertebral fractures are not only common in postmenopausal women but are also frequent in older men. In the large European Vertebral Osteoporosis Study (EVOS) among more than 15.000 people aged 50-79 years, the mean prevalence of radiographically assessed vertebral fractures in men was 12 to 20%, depending on the definition for vertebral fractures used [2]. Several other population-based studies among older men have been conducted, with prevalences ranging from 15 to 32% [3-7]. In all studies the highest prevalence of vertebral fractures among men was in the oldest age group, with prevalences varying from 25 to 35% in men older than 80 years [3, 5-7]

Together with age, osteoporosis is the major risk factor for the development of vertebral fractures [8,9]. Osteoporosis in men is, in comparison with women, more likely to be due to secondary causes, such as underlying diseases, the use of medication and excessive consumption of alcohol [10]. Other identified risk factors for vertebral fractures in men in population-based studies are previous fracture, falling, inactivity, low body weight, smoking and lower grip strength [6,9,11].

Vertebral fractures in men are clinically relevant. Like in women they increase the risk of subsequent vertebral and non-vertebral fractures [12,13] and risk ratios increase when vertebral fractures become more severe or multiple in a patient [12]. In addition, vertebral fractures are associated with a higher mortality [13,14] and are also in men related to pain [15], loss of function and a lower quality of life [3,16]. The presence of one or more vertebral fractures in men is an indication for treatment of the underlying osteoporosis [17]. However, approximately two thirds of the patients with vertebral fractures are not coming under clinical attention [18]. One of the reasons is that vertebral fractures can occur after a relatively small trauma (like bending forward or lifting) [19] and often have an atypical course [20].

Little is known about the prevalence and risk factors of vertebral fractures in patients visiting a geriatric outpatient clinic. One study showed a prevalence of 51% among geriatric outpatients, in majority women [21]. No studies are yet published on prevalence of vertebral fractures in male geriatric outpatients. The aim of this study was to investigate the prevalence of vertebral fractures in male geriatric outpatients and secondly to identify risk factors for vertebral fractures in these patients.

Methods

Participants

This study is a post hoc analysis of data obtained in two studies, which were conducted among geriatric outpatients in a large teaching hospital in Amsterdam, the Netherlands. All patients in these studies were consecutive first-time visitors of our diagnostic day hospital. They were referred by their general practitioner for various reasons like memory

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loss, falls, weight loss and polypharmacy. The cohorts were recruited in 2007 - 2008 [22] and in 2011 [unpublished data]. All consecutive male patients who visited the day hospital were included. All patients gave informed consent or if they were unable to judge, their caregivers gave informed consent. The exclusion criteria for these studies were no informed consent and if the patient was not able to undergo radiographs.

Measurements

All patients visiting the day clinic had a standard diagnostic procedure, a Comprehensive Geriatric Assessment. From the patient's chart the following data were obtained: medical history including previous fractures, medication use, body mass index, use of alcohol and/or tobacco, any falling in the last year. In addition, mobility of the patients was scored, in which mobility was defined as normal (stable and independent walking) or abnormal (unstable, use of walking aid or immobile). Co-morbidity was measured by using the Charlson Comorbidity Index score and was based on both medical history and the medical conclusions at the day clinic [23]. Cognitive function was assessed through the Mini Mental State Examination (MMSE). Routine laboratory investigation was performed including thyroid function, serum albumin, vitamin D, thiamine, vitamin B 12 and folic acid. All patients underwent a chest X-ray (posterior-anterior and lateral) and 133 patients also had a lateral spine X-ray. The presence of vertebral fractures was assessed by using the semi-quantitative method of Genant [24]. Two observers (HJ, M.Vis) independently scored the radiographs. Their conclusions were compared, when scores did not match, conclusion was reached by discussion. Fractures were graded as mild (Grade 1, 20-25% loss of height), moderate (Grade 2, 25-40% loss of height) or severe (Grade 3, $\geq 40\%$ loss of height) and were categorized by fracture type (wedge, biconcave or crush fracture). In patients who had more than one vertebral fracture the most severe fracture was graded.

Statistics

Statistical analysis was performed by using the Statistical Pack for the Social Sciences (SPSS version 21.0 for Windows, IBM). All variables were normally distributed. Patients with and without vertebral fractures were compared using independent t-test for continuous variables and Chi-square test for categorical variables. A two-tailed probability of $p < 0,05$ was defined as significant. Association between possible risk factors and the presence of a vertebral fracture was examined by using binary logistic regression for univariate analysis. A binary logistic multivariate analysis was performed to select independent risk factors for the presence of vertebral fractures in male patients. All variables with a p-value less than 0.10 were selected for this test. A forward and backward analysis was performed. In the same way risk factors were selected for patients with moderate and severe vertebral fractures (grade 2 and 3).

Results

The data of 177 men were analyzed. One patient with vertebral fractures based on metastatic disease was excluded. The remaining 176 men were included in this study, mean age 80.2 years (± 6.9 SD). These men had in 14% previous non-vertebral fractures. A clinical vertebral fracture had been diagnosed in 4 men (2%) prior to the visit and osteoporosis (defined as a T-score < -2.5) was previously diagnosed in another 4 men (2%). The average Charlson Comorbidity Index score was 2.41 indicating the presence of more than two chronic diseases per patient. Polypharmacy, defined as the chronic use of 5 or more different prescriptions, was present in 59% of the men. Abnormal mobility, defined as unstable walking, use of walking aid or immobility, was present in 54% of the men and 50% reported at least one fall in the previous year. The vitamin D level was below 50 nmol/l in 79% of the cases, and below 30 nmol/L in 32% of the cases.

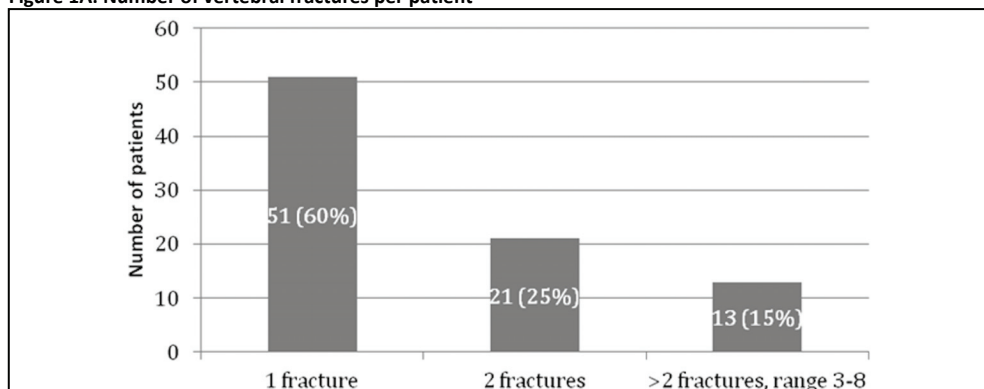
Prevalence of vertebral fractures in geriatric male outpatients

Of the 176 men, 85 (48 %) had one or more vertebral fractures of any kind on radiography. There were no reasons to suspect pathological fractures based on the X ray, previous medical history and the results of the geriatric screening.

Figure 1A shows the number of fractures per patient. For the 85 patients with a vertebral fracture, the mean number was 1.7 vertebral fractures per patient; 51 out of 85 patients (60%) had one fracture, 21 (25%) had two fractures and 13 men (15%) had 3 or more (up to eight) fractures. Consequently, 40% (34/85) of the men in this study with a prevalent vertebral fracture had multiple vertebral fractures.

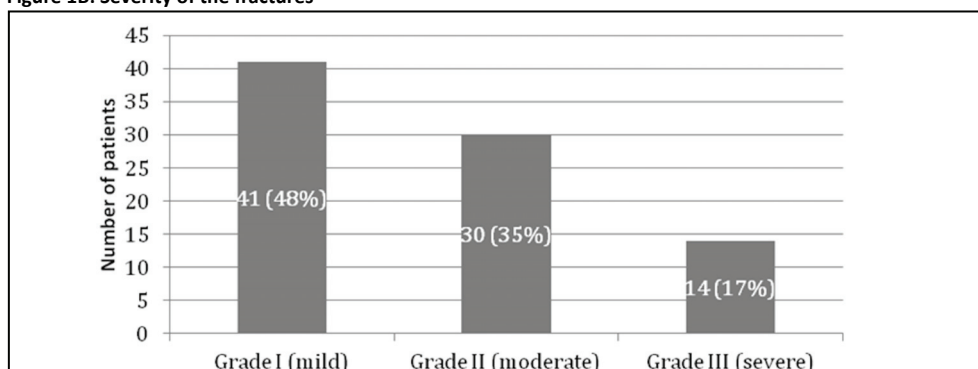
Figure 1B shows the severity of the vertebral fractures among the 85 patients. In the 85 men with a vertebral fracture the gradation of the (most severe) fracture was as follows: 41 (48%) had a mild fracture as most severe fracture; 30 (35%) had a moderate fracture and 14 men (17%) had a severe fracture. So, roughly half (52% - 44/85 cases) of the men with a prevalent vertebral fracture had a moderate or severe vertebral fracture as most severe fracture.

Figure 1A: Number of vertebral fractures per patient*



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Figure 1B: Severity of the fractures*



*85 out of 176 patients had one or more vertebral fractures. In this figure the number of vertebral fractures per patient (A) and the severity of the (most severe) fracture per patient (B) are displayed (n=85)

Table 1: Characteristics of patients with and without vertebral fractures

	No VF	With VF	Univariate analysis		
			Odd's ratio	95% CI	p-value
Number of patients (%)	91 (52)	85 (48)			
Age, years, mean \pm SD	79.5 \pm 7.0	81.1 \pm 6.6	1.03	0.99-1.08	0.15
Non-VF in history, n (%)	11 (12)	13 (15)	1.31	0.55-3.12	0.54
History of osteoporosis, n (%)	2 (2)	2 (4)			
Current Smoking, %	31	21	0.58	0.28-1.20	0.15
Current use of alcohol (>14 EH /week), n (%)	14 (15)	15 (18)	1.11	0.50-2.51	0.80
Body Mass Index, mean \pm SD	25.0 \pm 4.3	25.2 \pm 4.0	1.01	0.93-1.10	0.81
Number of Prescriptions, mean \pm SD	5.6 \pm 3.5	5.7 \pm 3.5	1.01	0.93-1.11	0.79
25(OH) Vitamin D, nmol/l, mean \pm SD	47 \pm 27	37 \pm 17	0.98	0.96-1.00	0.12
Serum Thiamin, nmol/l \pm SD	118 \pm 36	108 \pm 31	0.99	0.98-1.00	0.06
Thiamin < 100, n (%)	31 (35)	41 (49)	1.80	0.98-3.32	0.06
Serum albumin, g/l mean \pm SD	37 \pm 4	36 \pm 5	0.98	0.91-1.04	0.46
Charlson Index score, mean \pm SD	2.4 \pm 1.8	2.4 \pm 1.7	1.01	0.85-1.20	0.94
Reported falls, at least one in the last year, n (%)	33 (36)	34 (40)	1.39	0.70-2.73	0.35
Immobility, walking aid or wheelchair, n (%)	41 (45)	43 (47)	1.25	0.70-2.73	0.46
MMSE, mean \pm SD	23 \pm 5	22 \pm 5	0.98	0.92-1.04	0.46

Vf= Vertebral Fractures

Risk factors for vertebral fractures in geriatric male outpatients

Table 1 shows the characteristics of the patients with and without vertebral fractures. No statistical difference was found between both groups in any of the shown variables. In addition, there was no difference in the use of specific medication (diuretics, prednisone, proton pump inhibitors, antidepressants, anti-epileptics, calcium- and vitamin D suppletion, anti-osteoporotic medication), diabetes mellitus, hyperthyroidism nor serum levels of TSH, folic acid and vitamin B12 (data not shown). Since univariate analysis did not identify any significant risk factors, multivariate analysis was not performed.

In addition we regrouped the men without vertebral fractures and those having a mild fracture (grade 1) against the patients with moderate or severe vertebral fractures. This regrouping did not yield other relevant differences (data not shown).

Conclusion

To our knowledge this is the first study reporting an extreme high prevalence with a high amount of multiple vertebral fractures and a high amount of severe vertebral fractures in males of 80 years old presenting at a geriatric outpatient clinic. The severity of these fractures and the high number of vertebral fractures per patient is important because it is well known, that risk ratio's for subsequent fractures increase when severity of the vertebral fracture increases and number of vertebral fractures per patient rise [12,25]. Moreover, severe vertebral fractures predict strongly for hip fracture [26].

We found that 48% of the men in our study had at least one vertebral fracture and roughly half of them had a moderate or severe vertebral fracture. Noteworthy, of the 85 men with a vertebral fracture only 4 men (5%) were previously known with the diagnosis of vertebral fractures. This may indicate that the majority of the vertebral fractures in this patient group occurred relatively silent. The prevalence is much higher than the prevalence found among European men of the same age in population based studies [2-4]. In addition, 40% of the men with a vertebral fracture in our study had more than one vertebral fracture, which is higher in comparison to other European studies among elderly men reporting approximately 30% [15,27]. The observed high prevalence of vertebral fractures and the high amount of moderate and severe fractures and high amount of multiple fractures per patient in relation to individuals of the same age in population based studies, is most likely explained by the fact that these patients had a reason to visit a geriatric outpatient clinic. They had probably more co-morbidity, a higher fall risk and were more frail than elderly in population based studies.

However, this study did not show risk factors for prevalent vertebral fractures in our patient group. In particular, we could not confirm the identified risk factors from the literature for vertebral fractures in men in population based studies such as alcohol consumption, previous fracture, falling, inactivity, low body weight, smoking and lower handgrip strength. Remarkably, age was not a risk factor in our study. An explanation could be that there was selection by indication: this cohort was referred by their general practitioner for geriatric care. This implies that these patients were all biologically old (due to co morbidities), despite their calendar-age.

Another explanation for the negative risk factors is that the parameters we used were not sensitive enough. For example, there was no association between the presence of vertebral fractures and inactivity/immobility. The categories of immobility used in this study (normal as stable and independent walking or abnormal as unstable, use of walking aid or immobile) were not discriminative in these male geriatric patients, although the use of walking aid was proven discriminative in a large Dutch population based study [9]. For other parameters, like falling and previous fractures, we were partly dependent on

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information of the patient. The reliability of this information could be decreased by co-existing cognitive decline. Another hypothesis for the absence of known risk factors in this study is that this geriatric population of older men has other risk factors for vertebral fractures. Geriatric syndromes like sarcopenia and frailty might be correlated to vertebral fractures. There is evidence in literature that (vertebral) fractures, risk of falls and frailty are related in old age [28-30]. It is a limitation of this study that we did not measure frailty at baseline. Lastly, there was a trend towards an association of thiamin-levels and vertebral fractures. We did not find any earlier report about the association with vertebral fractures and thiamin-deficiency. We suggest that the underlying mechanism for an association, if any, of thiamin with vertebral fractures, could be malnutrition.

In summary, the high prevalence of 48%, the high amount of multiple vertebral fractures per patient and the high amount of moderate and severe vertebral fractures in geriatric males indicates that the underlying osteoporosis of the men in our study is severe. Consequently these men with a prevalent vertebral fracture, especially the men with multiple or more severe fractures, are at high risk for a new fracture of any site. Unfortunately, we could not identify any risk factor for the existence of vertebral fractures in these geriatric male patients, which makes it difficult to identify patients with vertebral fractures clinically without radiography. The combination of a high prevalence of vertebral fractures, the silent occurrence and the lack of risk factors for these geriatric male patients that could identify patients with vertebral fractures in our cohort, suggests that screening for vertebral fractures is better than case finding in male geriatric outpatients. Treatment to prevent subsequent fractures is widely available [17] and has shown to be relatively safe and effective to reduce vertebral fractures in men with 67% after two years [31]. However, further research need to be done to prove that screening for vertebral fractures in this specific patient group would be effective.

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